CLAIMS

1. A method for fabricating a semiconductor device, using a plasma etching system including a vacuum chamber, a susceptor arranged in the vacuum chamber for mounting a semiconductor wafer, a gas introducing means for introducing a material gas to the vacuum chamber and a means for introducing high-frequency power, the method comprising the steps of producing plasma from a gas introduced into the vacuum chamber by the gas introducing means using the high-frequency power; forming a plurality of holes selectively on a main surface of the semiconductor wafer in an atmosphere of the plasma; during or after the hole forming step, irradiating light having a continuous spectrum on a flat portion and a hole portion of the main surface of the semiconductor wafer and measuring the change in reflectivity of the flat portion and the hole portion.

2. A method for fabricating a semiconductor device as defined in Claim 1, wherein the light enters the main surface of the semiconductor wafer at right angles or diagonally thereto, and the reflectivity is measured from the ratio of intensity between the incident light and the reflected light.

3. A method for fabricating a semiconductor device as defined in Claim 1, wherein the light is white light and enters the main surface of the semiconductor wafer at right angles or diagonally

thereto, and wavelength dependency of the reflectivity is measured from the ratio of intensity between the incident white light and the reflected light.

4. A method for fabricating a semiconductor device as defined in Claim 1, wherein the main surface of the semiconductor wafer has an interlayer insulating film, and the plurality of the holes are formed in the interlayer insulating film.

5. A method for fabricating a semiconductor device comprising:

(1) a step of forming an insulating film on the semiconductor substrate and a mask on the insulating film, the mask having a hole portion formed with a plurality of hole patterns and a flat portion not formed with a hole pattern;

(2) a step of forming a plurality of holes in the insulating film by dry etching based on the mask;

(3) a step of irradiating light having a continuous spectrum on a flat portion and a hole portion of the film, measuring the change in reflectivity in the flat portion and the hole portion and forming a plurality of holes through the hole portion based on the result of measurement during the step of (2); and

(4) a step of burying a metal in the plurality of the holes of the hole portion.

6. A method for fabricating a semiconductor device as defined in Claim 5, wherein the light enters

a main surface of a semiconductor wafer at right angles or diagonally thereto, and the reflectivity is measured from the ratio of intensity between the incident light and the reflected light during the step (2).

7. A method for fabricating a semiconductor device as defined in Claim 5, wherein the light is white light and enters a main surface of a semiconductor wafer at right angles or diagonally thereto, and wavelength dependency of the reflectivity is measured from the ratio of intensity between the incident white light and the reflected light during the step (2).

8. A method for fabricating a semiconductor device comprising:

(1) a step of forming an insulating film on a semiconductor substrate and a mask on the insulating film, the mask having a hole portion formed with a plurality of hole patterns and a flat portion not formed with a hole pattern;

(2) a step of forming a plurality of holes in the insulating film by dry etching based on the mask;

(3) a step of measuring wavelength dependency of the reflectivity in the flat portion, a step of measuring wavelength dependency of the reflectivity in the hole portion, and the step of comparing the spectra of the wavelength dependency acquired from the hole portion and the flat portion with each other thereby to determine the amount of wavelength shift of an

interference peak position of the hole portion with respect to an interference peak position of the flat portion, during the step (2), after which a plurality of holes are formed through the hole portion based on the measurement result; and

(4) a step of burying a metal in the plurality of the holes of the hole portion.

9. A method for fabricating a semiconductor device as defined in Claim 8, wherein the light is incident on a main surface of a semiconductor wafer at right angles or diagonally thereto, and a reflectivity thereby is measured from the ratio of intensity between the incident light and its reflected light during the step (2).

10. A method for fabricating a semiconductor device as defined in Claim 9, wherein the light is white light.

11. A method for fabricating a semiconductor device by preparing a plasma etching system including a vacuum chamber, a susceptor arranged in the vacuum chamber for installing a semiconductor wafer, a gas introducing means for introducing the material gas to the vacuum chamber and a high-frequency power introducing means, the method comprising the step of converting to a plasma gas introduced into the vacuum chamber by the gas introducing means and forming a plurality of holes selectively on a main surface of the semiconductor wafer in a plasma atmosphere,

the plasma etching system including a light source for radiating detection light, a detection system having a beam splitter arranged in a light path, a lens, a spectrometer and a diode array, an XY movable table movable in horizontal direction in the detection system and a computer for storing data of the detection system, and the detection light from the light source being radiated on the main surface of the semiconductor wafer through a quartz window formed in a ceiling portion of the vacuum chamber; and

the method further comprising

a step of radiating the detection light from the light source in a flat portion and a hole portion of the main surface of the semiconductor wafer, and measuring the change in reflectivity in the flat portion and the hole portion, during or after the step of forming the holes.

12. A method for fabricating a semiconductor device as defined in Claim 11, wherein the light source is a Xe lamp.

13. A method for fabricating a semiconductor device as defined in Claim 11, wherein the detection light is incident on the main surface of the semiconductor wafer at right angles or diagonally thereto, and the reflectivity thereby is measured from the ratio of intensity between the incident light and its reflected light.

14. A method for fabricating a semiconductor

device as defined in Claim 11, wherein the detection light is white light and is incident on the main surface of the semiconductor wafer at right angles or diagonally thereto, and wavelength dependency of the reflectivity thereby is measured from the ratio of intensity between the incident white light and its reflected white light.

15. A method for fabricating a semiconductor device by preparing a plasma etching system including a vacuum chamber, a gas introducing means for introducing the material gas to the vacuum chamber and a high-frequency power introducing means, the comprising the step of converting to a plasma, by the high-frequency power, gas introduced into the vacuum chamber by the gas introducing means and forming a plurality of holes selectively on a main surface of a semiconductor wafer in a plasma atmosphere, wherein:

the plasma etching system includes a first electrode arranged in contact with the semiconductor wafer and movable in horizontal direction, a second electrode arranged in opposed relation to first electrode and movable in vertical direction, an impedance meter electrically connected to the first and second electrodes, and a computer electrically connected to the impedance meter through an A/D converter;

the method comprising a step of measuring an electrostatic capacitance of a flat portion and a hole

portion of the water on the main surface of the semiconductor wafer by an etching depth inspection unit after forming the holes, and a step of comparing the electrostatic capacitance acquired from a flat portion and the hole portion with each other and determining the difference between a measurement value of the electrostatic capacitance of the flat portion and a measurement value of the electrostatic capacitance of the hole portion.

16. A method for fabricating a semiconductor device as defined in Claim 15, further comprising a step of scanning the semiconductor wafer by the second electrode for measuring the hole portion, a scanning step determining the position of the second electrode in such a manner as to minimize the electrostatic capacitance.

17. A method for fabricating a semiconductor device as defined in Claim 15, wherein the plasma etching system includes a load lock chamber and an unload lock chamber, and the first and second electrodes are arranged in the unload lock chamber.

18. A method for fabricating a semiconductor device as defined in Claim 15, wherein a plurality of protruded electrodes in contact with the reverse surface of the semiconductor wafer are arranged on the first electrode.

19. An apparatus for fabricating a semiconductor device as defined in Claim 15, wherein the forward end

portion of the second electrode constitutes a circular surface having a diameter of 0.1 mm to 3 mm.

20. A method for fabricating a semiconductor device as defined in Claim 15, wherein the interval between the second electrode and the surface of the semiconductor wafer is between 0.1 μm and 50 μm.